



UNITED STATES MARINE CORPS
MARINE CORPS SYSTEMS COMMAND
2200 LESTER STREET
QUANTICO, VIRGINIA 22134-5010

IN REPLY REFER TO:
5720
DON-USMC-2023-015641
6 Sep 23

SENT VIA FOIA ONLINE TO: *dcdc4340@gmail.com*

Mr. Demarco Mayo-Cortez
2804 Ashbury Drive
Arlington TX 76015

SUBJECT: FREEDOM OF INFORMATION ACT (FOIA) DON-USMC-2023-015641

Dear Mr. Mayo-Cortez:

This responds to your FOIA request dated August 29, 2023, which requests a copy of ". . . information on the Danner company RAT boots that was issued in the physical year 2015. looking for any information on the results of testing of the boots and data of the quality of the boot."

Your request is hereby partially denied.

One page of the requested documents is protected pursuant to FOIA Exemption 5 U.S.C. § 552(b)(4) as proprietary and or financial information.

FOIA Exemption 5 U.S.C. § 552(b)(4) exempts from disclosure privileged or confidential trade secrets and commercial or financial information. The U.S. Supreme Court has recently explained that "where commercial or financial information is both customarily and actually treated as private by its owner and provided to the government under an assurance of privacy, the information is 'confidential' within the meaning of Exemption 4." Food Marketing Institute v. Argus Leader Media, 588 U.S. ____ (2019).

Review included consideration of the 'foreseeable harm standard', i.e., information which might technically fall within an exemption should not be withheld from a FOIA requester unless the agency can identify a foreseeable harm or legal bar to disclosure. No additional foreseeable harm has been noted.

Fees associated with processing your request are minimal and waived.

6 Sep 23

Because your request has been partially denied, this determination may be appealed to the Assistant to the General Counsel (FOIA) at:

Department of the Navy
Office of the General Counsel
ATTN: FOIA Appeals Office
1000 Navy Pentagon Room 4E635
Washington DC 20350-1000

For consideration, the appeal must be received in that office within 90 days from the postmark of this letter's envelope. Attach a copy of this letter and a statement regarding why you believe an adequate search was not conducted. Both your appeal letter and the envelope should bear the notation "FREEDOM OF INFORMATION ACT APPEAL". Please provide a copy of any such appeal letter to the MARCORSYSCOM address above.

Any questions concerning this matter should be directed to Mrs. Bobbie Cave at (703) 432-3934 or bobbie.cave@usmc.mil.

Sincerely,

S. A. ALLEN
By direction

RESULTS - density

Test method	SATRA TM68: 1992 'Density of cellular materials'	
Material description	Midsole material from five lots of RAT boots Midsoles understood to be polyether PU	
Dimensions of test specimen (mm)	6 x 6 x 1 cm	
Density of the test specimen (g/cm ³)	Danner FY14	Left 0.29 Right 0.27
	Danner FY14 new	Left 0.28 Right 0.28
	Danner FY06 no issues	Left 0.35 Right 0.36
	Wellco FY11 no issues	Left 0.35 Right 0.32
	Bates FY11 no issues	Left 0.32 Right 0.30
Deviations from standard method	Specimens not fully regular in shape	

Test method	SATRA TM134: 1998 (2010) 'Density of materials by volume displacement'	
Material description	Midsole material from five lots of RAT boots Midsoles understood to be polyether PU	
Apparent density of the test specimen (g/cm ³)	Danner FY14	Left 0.31 Right 0.29
	Danner FY14 new	Left 0.31 Right 0.33
	Danner FY06 no issues	Left 0.40 Right 0.41
	Wellco FY11 no issues	Left 0.40 Right 0.35
	Bates FY11 no issues	Left 0.38 Right 0.34
Deviations from standard method	Very slight water absorption may have occurred into the specimens	

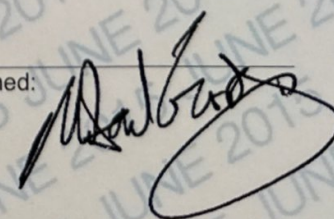
COMMENTS ON DENSITY

We understand your minimum specification to be 0.40. We do not know if this relates to a fully or partly skinned specimen ('skin' = moulded surface) or to specimens with a complete set of split surfaces. With polyether PU the density of the interior material is generally much lower than the surface skin density or the average density of a whole skinned piece. Therefore these seemingly low values are not necessarily unacceptable and our own minimum density recommendation would be 0.30 which is largely achieved.

The two methods give broadly similar values (TM134 values slightly higher than TM68 values) and a similar ranking and this shows that the Danner materials have lower density than the others. The worn (failed) and as-yet unworn Danner FY14 products have essentially the same midsole density values as one another (and lower than the Danner FY06 batch which reportedly gave no issues).

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RESULTS – outsole to midsole adhesion

Test method	SATRA TM411: 1992 Peel strength of footwear sole bonds	
Footwear description	Five lots of RAT boots with rubber outsoles and polyether PU midsoles	
Adhesive type used	Unknown	
Test locations	Outsole to midsole	
Conditioning	>48 hours at 23°C, 50% relative humidity	
Peel direction	Along (parallel to featherline)	
Individual peel strengths (N/mm) (average during each peel) 4 specimens per pair	Danner FY14	4.2, 4.2, 5.0, 4.2 Mean 4.4 Entirely deep tear of midsole
	Danner FY14 new	5.0, 4.3, 4.1, 4.6 Mean 4.5 Entirely deep tear of midsole
	Danner FY06 no issues	5.9, 4.1, 2.7, 8.8 Mean 5.4 Mainly tear of midsole
	Wellco FY11 no issues	4.4, 3.9, 4.5, 4.1 Mean 4.2 Mainly deep tear of midsole
	Bates FY11 no issues	4.5, 3.9, 2.5, 4.7 Mean 3.9 Mainly deep tear of midsole
Deviations from standard method	None	

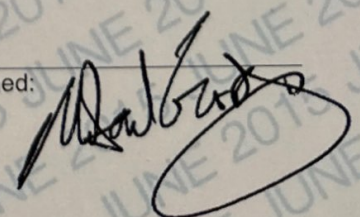
COMMENTS ON MIDSOLE TO OUTSOLE ADHESION

All of the results across all five lots achieve our minimum recommended 2.5 N/mm for interlayer bond strength.

The limiting factor, as expected for a well-made bond, is the tear strength of the midsole material and this achieves good levels in all cases.

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RESULTS – chemical analysis

The method is SATRA TM 332: 1992 Chemical analysis of polyurethanes.

This test has two parts:

- The 'acetone extractable matter' is a measure of the proportion of relatively low molecular weight polymer within the material.
- The 'acid value' is a measure of acidity determined by the amount of potassium hydroxide required to neutralise one gram of the sample. If hydrolysis has occurred this can cause a high acid value to be evident, in addition to a high acetone extractable matter value.

Sample	Acetone extractable matter (%)	Acid value
Danner FY14	20.0	0.9
Danner FY14 new	12.1	1.1
Danner FY06 no issues	7.0	0.8
Wellco FY11 no issues	8.6	0.2
Bates FY11 no issues	9.3	0.6

COMMENTS ON CHEMICAL ANALYSIS

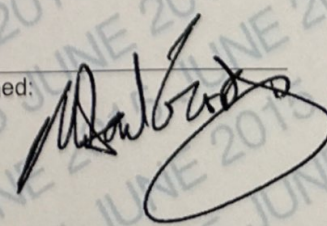
The recommended range for acetone extractable matter is 5-9%. This is the expected range for correctly constituted material in non-degraded condition giving optimum physical properties. The precise optimum value will vary from compound to compound and some may be slightly outside this range.

The samples described as Danner FY14 and Danner FY14 new were found to contain higher amounts of acetone extractable matter compared to the samples described as Danner FY06 no issues, Wellco FY11 no issues and Bates FY11 no issues. However all the samples had an acid value below the maximum recommended value which suggests that hydrolysis has NOT occurred to the Danner FY14 samples. This is as expected for polyether PU and also for samples which are recently made and therefore have had little opportunity to hydrolyse (ie 'Danner FY14 new').

The acetone extract results suggest that there is something unusual about the chemical composition of the 'Danner' midsoles, especially the failed one in the first line of the table. These values are higher than expected for normally constituted PU. They could mean that there was some mixing fault leading to under polymerisation. It is therefore strange that this did not seem to weaken the adhesion (tear) strength, as seen above. But it might lead to other physical weakness and perhaps account for the damage witnessed in this sole. We wonder if the slightly low densities of the Danner FY14 samples (relative to the others) are connected with this or are a coincidence.

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TESTS ON FIVE LOTS OF RAT BOOTS TO COMPARE MIDSOLE PROPERTIES (CHEMICAL ANALYSIS, DENSITY, DELAMINATION STRENGTH BY METHODS SATRA TM332, TM68, TM411)

SAMPLES SUBMITTED

Five lots of Rugged All Terrain boots from different batches (4 pairs unworn, one pair worn).

The worn pair is exhibiting midsole damage in the heel.

The outsoles are understood to be vulcanised rubber and the midsoles are understood to be polyurethane (polyether type).

The references are as follows:

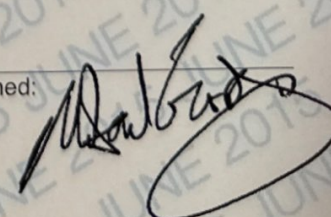
Batch	Vendor, year (SATRA REF)
One pair of failed boots	Danner FY14
One pair of new boots from same contract of failed boots	Danner FY14 new
One pair of old boots from old contract with no failures	Danner FY06 no issues
One pair of new boots from a different vendor on an old contract with no reported failures	Wellco FY11 no issues
One pair of new boots from another vendor on an old contract with no reported failures	Bates FY11 no issues

The general style, the specific products and the manner of failure is illustrated on the following pages.

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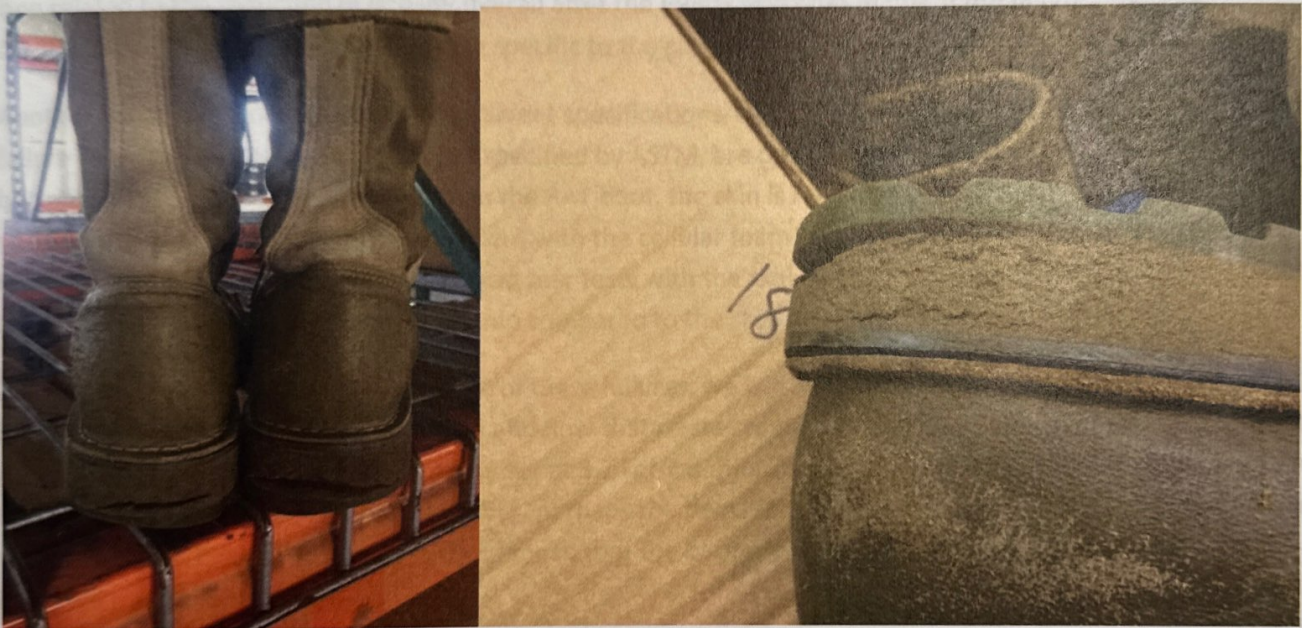
RAT PU Midsole Failure Issue

Problem Statement

Danner has received feedback from the Marine Corps, via Provengo, stating that 26 PR have been identified, from the partial inspection of the 104 PR of TWRAT boots that were shipped to the Marines in fall of 2014 as exhibiting disintegration and failure of the PU Midsole after being used in the field.

We believe these are boots from the first CLIN shipment of 200 PR. The majority of these boots were manufactured by Danner in October of 2014, but Mfg Dates on the boot labels need to be verified. These boots contained PU Midsoles made by Meramec utilizing the ML309 Polyether Polyurethane compound.

The boots that have been returned are showing a similar pattern of PU failure. The failure mode is primarily a horizontal cracking of the PU layer within itself in the heel of the midsole. There is no evidence of delamination between the PU and the surrounding rubber layers.



Analysis

We first reviewed our customer returns data for any spikes in returns for the same issue on all other Danner product that uses the same ML309 PU material. Not a single return for midsole breakdown or disintegration has been recorded since 2013.

Upon very preliminary analysis, Meramec characterizes this failure as a "fracture" of the PU foam cell structure.

We are beginning to probe Meramec as to whether these midsoles could be an "off-ratio or resin rich" midsole. They acknowledged this is a possible root cause in some initial correspondence on this topic. This means the "mix" of materials, [Iso/Polyol] may not have been correct. We have not yet verified with Meramec whether they can run a test on assembled boots or even raw midsoles to directly determine if the mix is correct after the fact.

Testing performed by Danner thus far on boots returned by USMC via Provengo:

- Material on returned boots is confirmed to be Polyether PU (as opposed to Polyester) by independent lab test. Meramec only makes Polyether PU, which by nature is resistant to hydrolysis.
- Hydrolysis test on Midsoles of returned boots and Midsole components with skin removed, is underway at outside lab (cleavage of chemical bonds by the addition of water)
- Ross Flex test and Abrasion test from outside lab is requested and due in 1.5 weeks after hydrolysis test has completed. PU that has been exposed to water during the hydrolysis test will be flexed, as well as PU that was not exposed to water.
- Trouser Tear strength and Tensile strength should be tested on returned full boots if possible. At a minimum this test should be performed on current inventory of raw PU midsoles.

One specific question to answer is whether this failure mechanism is happening at the same rate in OS42 midsoles as in the current ML309 midsoles. The properties of these materials are supposedly almost identical, albeit their chemical makeups are different. If the failure rate is the same, then this suggests that the root cause is a general one related to the reduction in density overall after the PP303 was phased out. If the failure rate is higher in the ML309, then this suggests the problem is specific to the current formula or current process.

Another major question is whether the current specifications/tests actually have any direct correlation to this failure mode. All of the current tests, as specified by ASTM, are done on test slabs with the skin on the top and bottom surfaces. However when in use in the RAT boot, the skin is removed from all surfaces of the midsole. So perhaps the ASTM tests will mask a problem with the cellular foam structure due to the skin being intact. We think it would be prudent to run tensile and tear tests with the skin removed on multiple batches of material to see if it varies more and by what magnitude compared to the skin-on standard tests.

In order to determine the true root cause of these failures, we will need to know what conditions and forces these boots have been subjected to in the field and how that relates to the specifications. For example, the contract specification for Tear Strength is currently set at 3.7 kgf/cm min. The C of C data suggests the ML309 compound has a Tear Strength of 6.8 kgf/cm. However, perhaps the boots in the field are actually being subjected to Tear forces on the order of 8 kgf/cm. This could mean that the boot meets specification but does not meet the intended performance in the field.

Action Plan

- Complete scheduled tests at outside lab for Ross flex.
- Schedule tests for Tensile and Tear strength tests with and without skin. Use midsoles out of returned boots as well as raw ML309 midsoles in inventory. Use midsoles out of boots found with older PP303 and OS42 compounds for comparison.
- Determine if Tear strength or Tensile strength tests correlate with field failure mode- may need to field test different compounds side-by-side.
- Determine if Meramec process is in control in regards to Mix Ratio, Tear Strength, Tensile Strength, Density, and Durometer

408 Per Day

RAT Midsole History

- Marine Corp opened the Density (gm/cc) specification in ~2005-2006 from .50-.60 range to .40-.60 range. This allowed the opportunity to reduce weight and reduce cost. PP303 and OS42 materials were both made by Meramec from 1996 onward. PP303 compound was historically used in the heavy work boot market.
- **October 2010 (Approx.):** Compound changed from PP303 to OS42
 - Technical Specs:
 - OS42 was lower density than PP303 - old
 - OS42 15% lighter weight than PP303 - old
 - Both compounds are still Polyether Polyurethane *
 - Both compounds meet Military specifications *
 - Reasons: According to Meramec, DoD and DLA had requested that industry provide a lighter weight, lower cost midsole
- **October 2012:** Compound changed from OS42 to ML309. Transition took place at Danner over several months. As inventory of OS42 midsoles were exhausted of each size, they were phased into the ML309. New Part numbers were issued for traceability.
 - Technical Specs:
 - ML309 is slightly lower density than OS42
 - 5-8% lighter with same physical properties
 - Both compounds are still Polyether Polyurethane
 - Both compounds meet Military specifications
 - Testing performed by Danner from June-August 2012:
 - Bond strength to Rubber outsole and Midsole matched OS42
 - Cosmetics after roughing and Sanding were comparable
 - Field testing revealed equal wear and damage to midsoles on both compounds. Field testing performed via Scholarship Services. 5 PR of ML309 were tested alongside 5 PR of OS42.
 - Water retention was equivalent after removing from a standardized soak time.
 - Reasons: Change was requested by Meramec for the following reasons:
 - RSL compliant (Cal Prop 65) [the OS42 system was going to have to be modified regardless to meet this]
 - Improved processing (reduce # of rejects and therefore avoid a 5% price increase)
 - Note: going back to OS42 is not an option; some of the chemistry for the system is no longer available.
- **April 23rd 2015:**
 - Met with Meramec to understand what their standard process testing is.
 - In Process testing:
 - Cup shots are taken every hour. The skin hardness is checked to see that it is setting up within normal parameters. The tack of the skin is checked. The top of the cup shot is cut off and the internal cell structure is visually inspected for dispersion and swirl patterns.
 - Test slabs of 6" x 8" x ½" thickness are poured every day from every machine. These slabs are then die-cut into standardized sample shapes and run through all of the Military specification tests.

- C of C's are issued for each Midsole shipment to Danner.
- Mean and Std Deviation of all ASTM test data Production over the last several years has been requested by Danner from Meramec
- Abrasion is not a standard test run on Midsole material (not in the Military requirements)
 - Abrasion (DIN) results requested by Danner from Meramec

The following are test results received by Danner from Meramec showing the performance of each PU formula type. These results are only from one particular C of C for each formula, so therefore do not reflect the overall mean and std dev of parts made over the course of time.

TESTS PERFORMED	TEST METHOD	PP303 TEST RESULTS (FEB/2007)	OS42 TEST RESULTS (~ 2010)	ML309 TEST RESULTS (~ 2012)	Military STANDARD
Density, gm/cc	ASTM D-297	0.60	0.46	0.44	0.40 - 0.60
Hardness, Shore A	ASTM D-2240	67	63	61	50 - 75
Tensile Strength	ASTM D-3574	36.90 kgf/cm ²	28.0 kgf/cm ²	29.7 kgf/cm ²	25 kgf/cm ² min
Elongation	ASTM D-3574	417%	391%	328%	250% min
Trouser Tear Strength	ASTM D-3574	9.6 kgf/cm	6.3 kgf/cm	6.8 kgf/cm	3.7 kgf/cm min
Volume Swell 24 hrs ASTM Oil #3	ASTM D-471	5.4%	6.6%	5.7%	10% max
Compression Set	SATRA TM64	6.43%	7.2%	6.4%	20% max
Ross Flex, -5°C	ASTM D-1052 Modified	0%	0%	0%	900% at 150,000 cycles
Water Absorption %	ASTM D2842	2.75%	1.15%	0.86%	
DIN (Volume Loss)		~900	~225	~300	

*(ML309)
602 + 100%*

RAT Boot FUE “K” Co.

Control Test RAT / Current Midsole
Alternative “C” .40



Control Test RAT / Current Midsole
Alternative “C” .40

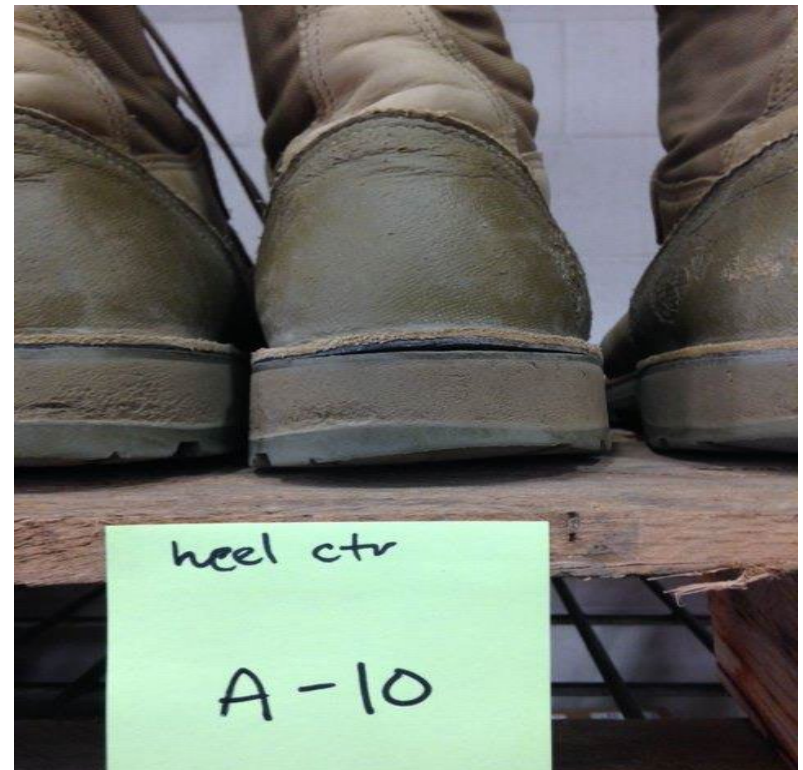


RAT Boot FUE "K" Co.

Alternative "A" .56



Alternative "A" .56



RAT Boot FUE “K” Co.

- Alternative “B” .70



RAT Boot FUE “K” Co.

- Alternative “B” .70



RAT Boot FUE “K” Co.

- Non Impregnated Leather



RAT Boot FUE “K” Co.

- Non Impregnated Leather



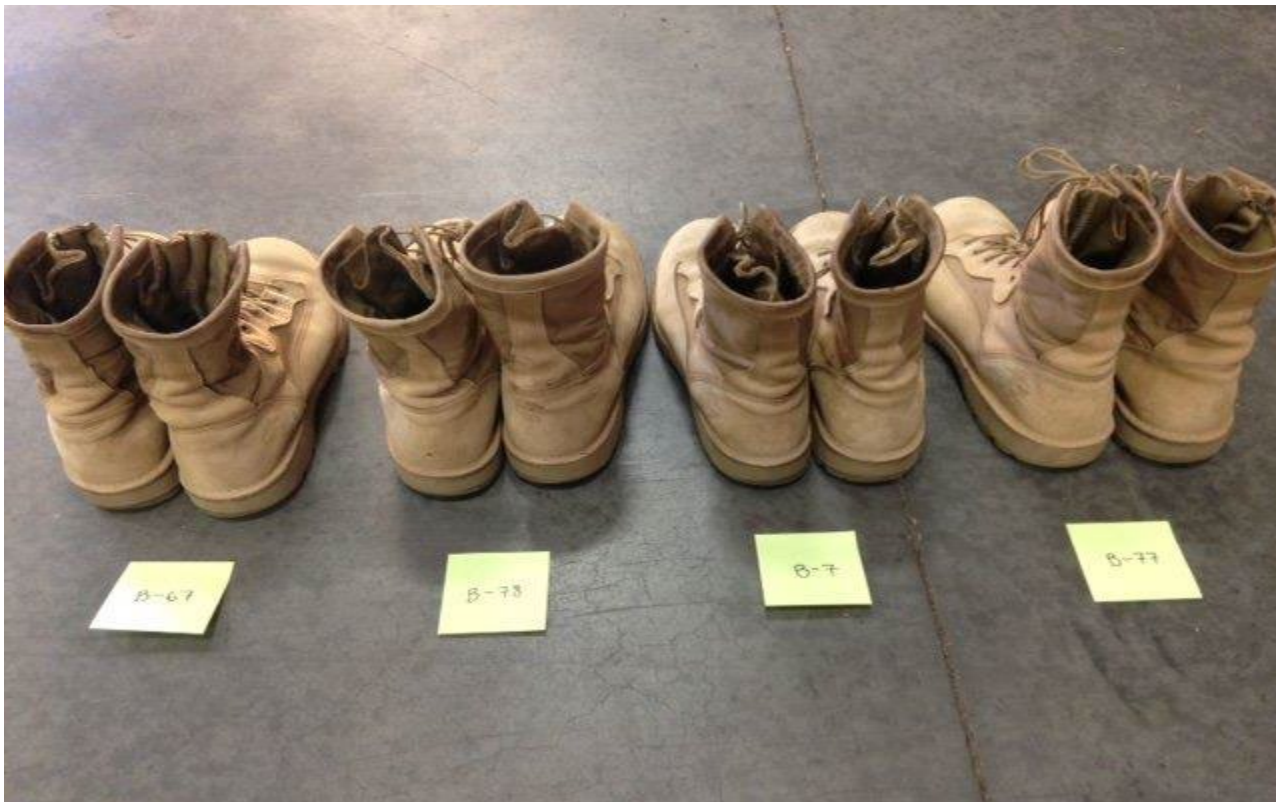
RAT Boot FUE “K” Co.

- Non Impregnated Leather



RAT Boot FUE “K” Co.

- Non Impregnated Leather



RAT Boot FUE “K” Co.

- .40 performed as expected, minor to major degradation within PU midsole
- .56 performed less than anticipated
- .70 performed better than expected
- PU midsole capable of withstanding the numerous hours of close order drill (COD) time on the asphalt grinder
- COD was the major contributor to the PU midsole failing at the MCRDs

RAT Boot FUE “K” Co.

- Recommended COA
 - Immediately all RAT boots will be manufactured utilizing the .70 midsole-pending shock attenuation results
 - Recommend removing the Impregnated Leather for a decrease in weight, dry out time and improved appearance

Rugged All Terrain (RAT) Boot User Evaluation at Marine Corps Recruit Depot San Diego Report

Written by Chris Diaz

BACKGROUND AND USER EVALUATION DESIGN

The Rugged All Terrain (RAT) Boots were experiencing catastrophic midsole failure rates at the Marine Corps Recruit Depots (MCRDs). The midsole failure, which rendered the boot unserviceable, was most commonly seen with the Danner manufactured boot. To date, this defect has been limited to the MCRDs. The midsole failure is broadly characterized by the disintegration or crumbling of the polyurethane cushion midsole. Industry has identified an alternate polyurethane compound which is available in two densities (0.56 and 0.70) and could potentially replace the current polyurethane midsole used in the RAT boot.

The user evaluation was designed to obtain feedback on the RAT boots manufactured by Danner with the alternate polyurethane midsole; 140 pairs of each of the two density midsoles. This test was to validate whether Danner's RAT boot produced with an alternative polyurethane cushion midsole meets the RAT boot requirements and can withstand the rigors of basic training. The Marine Corps tested these boots on recruits at Marine Corps Recruit Depot, San Diego. The RAT boots durability data and survey results are contained in this report.

EXECUTIVE SUMMARY

The user evaluation (UE) was conducted from late June to mid-September 2015 (approximately 82 days) with 370 recruits at Marine Corps Recruit Depot San Diego. The 3 RAT boot types tested, A) ML308 0.56 Midsole, B) M308 0.70 Midsole, and C) Standard RAT boot with 0.40 Midsole, all were the same design and only variation was the midsole material, density, and a variation with no impregnated leather toe and heel caps. As the boots contained the same design and same manufacturer, significant differences between the means for the boot types on survey questions about fit, comfort, and performance characteristics were not expected and for the most part were not found (exception blisters on the back of the heel).

In terms of durability, Boots A & B received significantly higher mean ratings than Boot C for Heel and Sole Area durability and received mean ratings in the "slightly satisfied" range. The heel and sole area durability ratings are an indicator that the midsole changes improved the perceived durability of the RAT boots. However, the durability inspection data showed that only Boot B had less polyurethane midsole failures, 7% of pairs, than Boot C (control boot), which saw failure in 62% of pairs. Also, the inspection data showed that Boots A & B had more sole delamination, 22% and 31% of pairs, respectively, than Boot C, 6% of pairs. The lower percentage of Boot C sole delamination is consistent with Boot C polyurethane midsole failing before sole delamination could occur. Nonetheless, all boot types exceed the acceptable 3% failure rate as specified in the RAT Boot purchase description.

The toe area for Boots A & B received mean ratings for durability in the "poor" range. The inspection pictures show extreme wearing in the toe cap areas on some A Boots.

In terms of performance and comfort there were several areas of concern for all boots tested. The mean satisfaction ratings for comfort while hiking were in the "uncomfortable" range for hiking and "neutral" range for running. The boots only received mean ratings in the

“comfortable” range for walking, which indicates that the Boots are not comfortable for mission related use. Furthermore, 70% of wearers experienced blisters in the toes, 28% in the ball of the foot, 41% on the back of the heel, and 25% on the bottom of the heel; which indicates additional fit and comfort issues with the boot design. All boot types received mean overall performance and liking ratings in the “neutral” range. For overall liking, only 62% of Boot A wearers and 58% of Boot B and C wearers rated the boot in the “like” range.

Overall there is not strong acceptability of the RAT boot design amongst the Marines recruits who tested the boot at Recruit Depot San Diego as only 60% of recruits liked the boots they tested. The higher density polyurethane midsole in Boot B did correct the midsole issues previous seen in the current RAT Boot; however, there is an unacceptable amount of sole delamination in Boot B based on the performance requirements in the RAT Boot purchase description.

DURABILITY INSPECTION SUMMARY

RAT Boots were inspected after the user evaluation for polyurethane midsole failures, sole delamination, seam issues, vent hole issues, and other issues. The inspection data reported focuses on the midsole durability and sole delamination. The RAT Boot Purchase Description 13-02 dated 1 Dec 2014 specifies that a failure rate of three (3) percent or greater will be considered a failure.

Polyurethane Midsole Durability

The polyurethane midsole failures were classified as minor, major, or critical. Boot types A & C both had 60% or more of the Boot pairs tested sustain polyurethane midsole failures in both the left and right boot. Boot B had 7% of the boot pairs with midsole failure in at least one on the boots of the pair, which still exceeds the 3% failure rate specified in the Purchase Description.

Boot Type	Polyurethane Midsole Issue (% of pairs)				
	Minor	Major	Critical	Minor, Major, or Critical	Both Boots Minor, Major, Critical
A	58%	22%		64%	62%
B	6%	1%		7%	1%
C	48%	20%	9%	62%	60%

Sole Delamination

The test Boot Types A & B had a higher incident of sole delamination than the control RAT Boot (Type C). All three boot types had failures above specified the 3% failure rate. The lower rate of sole delamination in Boot C was likely due to polyurethane midsole failure before the wear point at which sole delamination may occur.

Boot Type	Sole Delamination (% of pairs)
A	22%
B	31%
C	6%

SURVEY SUMMARY

For scale ended questions, excluding fit questions, the mean rating, standard deviation, and number of respondents are reported below. Mean ratings in the satisfied/easy/comfortable/like range ($x \geq 5$) are highlighted in **green**; mean ratings in neutral/neither difficult nor easy/neither poor nor good/neither like nor dislike range ($3 > x > 5$) are highlighted in **yellow**; and mean ratings in the dissatisfied/difficult/uncomfortable/dislike ($x \leq 3$) are highlighted in **red**.

For dichotomous (yes/no) and scale ended fit questions, the percentage of responses per category are reported. Where the response is favorable, percentages are highlighted in green if greater than or equal to 80%. If the favorable response is less than 50% it is highlighted in red. Yellow highlights show areas of concern where favorable ratings did not reach the 80% mark.

SECTION I: TEST ITEM INFO

1. Which boot TYPE did you test? (Circle one) A B C

Boot Type	A	B	C	Total
Number Issued	134	127	109	370
Number of Completed Surveys	113	104	93	310
Response Percent	84%	82%	85%	84%

SECTION II: RAT BOOTS – DONNING, DOFFING, AND FIT

3. Please rate how easy/difficult it was to **put on, take off and break-in** the RAT boots? Please fill-in one bubble.

Very Difficult	Moderately Difficult	Slightly Difficult	Neither Difficult nor Easy	Slightly Easy	Moderately Easy	Very Easy
①	②	③	④	⑤	⑥	⑦

	Boot Type	N	Mean	Std Dev
Don	A	113	4.6	1.56
	B	104	4.6	1.60
	C	93	4.6	1.53
	All	310	4.6	1.56
Doff	A	113	4.6	1.54
	B	104	4.5	1.57
	C	93	4.3	1.51
	All	310	4.5	1.54
Break In	A	113	4.5	1.70
	B	104	4.4	1.47
	C	93	4.5	1.46
	All	310	4.5	1.55

There were no significant differences between the mean ratings for the different Boot Types for Donning, Doffing, and Break-in.

4. Approximately how many days did it take to break in the RAT boot?

	Boot Type	N	Mean	Std Dev	Range	Median
Days Until Break In	A	110	11.3	12.6	0 - 82	7.5
	B	102	11.0	9.1	0 - 60	9.5
	C	91	11.2	8.9	1 - 60	7
	All	303	11.1	10.4		7

5. Please rate the **fit** for the areas of the RAT boots using the 5-point rating scale below.

Too Small	Slightly Too Small	Just Right	Slightly Too Big	Too Big
①	②	③	④	⑤

	Boot Type		Too Small or Slightly Too Small	Just Right	Slightly Too Big or Too Big	Total
Toe Area	A	N	40	54	19	113
		%	35%	48%	17%	
	B	N	39	48	17	104
		%	38%	46%	16%	
	C	N	39	44	10	93
		%	42%	47%	11%	
Arch Area	A	N	20	82	10	112
		%	18%	73%	9%	
	B	N	16	79	9	104
		%	15%	76%	9%	
	C	N	19	65	8	92
		%	21%	71%	9%	
All		N	55	226	27	308
		%	18%	73%	9%	

	Boot Type		Too Small or Slightly Too Small	Just Right	Slightly Too Big or Too Big	Total
Heel Area	A	N	19	75	19	113
		%	17%	66%	17%	
	B	N	21	59	24	104
		%	20%	57%	23%	
	C	N	25	55	13	93
		%	27%	59%	14%	
	All	N	65	189	56	310
		%	21%	61%	18%	
Ankle Area	A	N	7	81	25	113
		%	6%	72%	22%	
	B	N	12	75	17	104
		%	12%	72%	16%	
	C	N	14	63	16	93
		%	15%	68%	17%	
	All	N	33	219	58	310
		%	11%	71%	19%	
Lace Area	A	N	11	80	22	113
		%	10%	71%	19%	
	B	N	14	63	26	103
		%	14%	61%	25%	
	C	N	11	71	11	93
		%	12%	76%	12%	
	All	N	36	214	59	309
		%	12%	69%	19%	

There were no significant differences in the ratings for fit for the different Boot Types.

6. Did the RAT boots fit properly according to your typical boot size?

(Y)

(N)

	Boot Type		No	Yes	Total
Proper Fit to Typical Boot Size	A	N	21	91	112
		%	19%	81%	
	B	N	13	90	103
		%	13%	87%	
	C	N	17	76	93
		%	18%	82%	
	All	N	51	257	308
		%	17%	83%	

7. Were your feet stable inside the RAT boots when the laces were tightened?

(Y)

(N)

	Boot Type		No	Yes	Total
Feet Stable in RAT Boot Issued	A	N	20	93	113
		%	18%	82%	
	B	N	15	89	104
		%	14%	86%	
	C	N	9	84	93
		%	10%	90%	
	All	N	44	266	310
		%	14%	86%	

8. Please rate how **comfortable/uncomfortable** the test boot areas listed below were while you were performing activities; use the 7-point rating scale.

Very Uncomfortable	Moderately Uncomfortable	Slightly Uncomfortable	Neutral	Slightly Comfortable	Moderately Comfortable	Very Comfortable
①	②	③	④	⑤	⑥	⑦

	Boot Type	N	Mean	Std Dev
Toe Area	A	111	3.7	1.86
	B	104	3.5	1.67
	C	93	3.4	1.67
	All	308	3.6	1.74
Arch Area	A	113	4.2	1.61
	B	103	4.5	1.57
	C	93	4.1	1.62
	All	309	4.3	1.60
Heel Area	A	113	4.0	1.89
	B	101	3.8	1.92
	C	93	3.7	1.74
	All	307	3.8	1.85
Ankle Area	A	113	4.9	1.51
	B	102	4.8	1.55
	C	91	4.7	1.41
	All	306	4.8	1.49
Collar Area	A	113	5.1	1.37
	B	103	5.1	1.47
	C	92	5.0	1.36
	All	308	5.1	1.40
Lace Area	A	112	4.9	1.43
	B	104	4.9	1.57
	C	93	4.9	1.35
	All	309	4.9	1.45
Lining	A	113	4.9	1.69
	B	104	4.8	1.66
	C	93	4.7	1.30
	All	310	4.8	1.57

There were no significant differences in the means for the Boot Types for comfort.

SECTION III: RAT BOOTS – DURABILITY

9. Please rate how the **exterior of the RAT boots held up** during the test period using the 7-point rating scale below.

	Very Poor	Moderately Poor	Slightly Poor	Neither Poor nor Good	Slightly Good	Moderately Good	Very Good
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	Boot Type	N	Mean	Std Dev
Toe Area	A	112	3.5	2.06
	B	102	3.8	2.00
	C	93	4.1	2.09
	All	307	3.8	2.06
Stitching on Upper Area	A	111	5.7	1.38
	B	102	5.6	1.39
	C	93	5.3	1.58
	All	306	5.5	1.45
Heel	A	112	5.0*	1.58
	B	102	5.0*	1.73
	C	93	4.2	1.87
	All	307	4.8	1.76
Sole Area	A	111	5.1*	1.54
	B	102	5.2*	1.47
	C	93	4.5	1.72
	All	306	4.9	1.60

* Boots A and B received significantly higher mean ratings than Boot C for Heel and Sole Area durability.

X	Y	Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	Prob > F
Boot Type	Toe Area	Type	2	16.745	8.373	1.986	0.139
		Error	304	1281.418	4.215		
		C. Total	306	1298.163			
Boot Type	Stitching on Upper Area	Type	2	8.122	4.061	1.936	0.146
		Error	303	635.737	2.098		
		C. Total	305	643.859			
Boot Type	Heel	Type	2	42.261	21.130	7.130	0.001
		Error	304	900.977	2.964		
		C. Total	306	943.238			
Boot Type	Sole Area	Type	2	31.156	15.578	6.273	0.002
		Error	303	752.403	2.483		
		C. Total	305	783.559			

10. Was there any sole separation whatsoever throughout the entire boot? (i.e., **FRONT? MIDDLE? BACK?**)

(Y)

(N)

	Boot Type		No	Yes	Total
Sole Separation	A	N	91	22	113
		%	81%	19%	
	B	N	74	30	104
		%	71%	29%	
	C	N	73	20	93
		%	78%	22%	
	All	N	238	72	310
		%	77%	23%	

11. Did the lining wear out easily and/or come apart?

Ⓚ

Ⓝ

	Boot Type		No	Yes	Total
Lining Wear Out	A	N	106	7	113
		%	94%	6%	
	B	N	101	3	104
		%	97%	3%	
	C	N	87	6	93
		%	94%	6%	
	All	N	294	16	310
		%	95%	5%	

12. Did the seams of the RAT boots unravel, come apart or break?

Ⓚ

Ⓝ

	Boot Type		No	Yes	Total
Seam Failure	A	N	104	9	113
		%	92%	8%	
	B	N	96	8	104
		%	92%	8%	
	C	N	80	13	93
		%	86%	14%	
	All	N	280	30	310
		%	90%	10%	

13. Did you experience any cracking in the heel area, outside or inside, of the boot?

Ⓚ

Ⓝ

	Boot Type		No	Yes	Total
Heel Cracking	A	N	59	54	113
		%	52%	48%	
	B	N	57	47	104
		%	55%	45%	
	C	N	60	33	93
		%	65%	35%	
	All	N	176	134	310
		%	57%	43%	

14. If you answered YES to questions 10 – 13, do you think the damage was from normal wear and tear or something that should not have happened?

	Sole Separation	Lining defect	Seam failure	Cracking
Normal wear & tear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Should not have happened	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Boot Type		Damage from Normal Wear and Tear	Damage Should Not Have Happened	Total
Sole Separation	A	N	12	4	16
		%	75%	25%	
	B	N	19	8	27
		%	70%	30%	
	C	N	15	5	20
		%	75%	25%	
	All	N	46	17	63
		%	73%	27%	

	Boot Type		Damage from Normal Wear and Tear	Damage Should Not Have Happened	Total
Lining Wear Out	A	N	1	1	2
		%	50%	50%	
	B	N	2	1	3
		%	67%	33%	
	C	N	4	1	5
		%	80%	20%	
	All	N	7	3	10
		%	70%	30%	

	Boot Type		Damage from Normal Wear and Tear	Damage Should Not Have Happened	Total
Seam Failure	A	N	4	3	7
		%	57%	43%	
	B	N	3	3	6
		%	50%	50%	
	C	N	7	4	11
		%	64%	36%	
	All	N	14	10	24
		%	58%	42%	

	Boot Type		Damage from Normal Wear and Tear	Damage Should Not Have Happened	Total
Heel Cracking	A	N	35	13	48
		%	73%	27%	
	B	N	31	12	43
		%	72%	28%	
	C	N	26	4	30
		%	87%	13%	
	All	N	92	29	121
		%	76%	24%	

15. Did you experience any other durability/damage issues with the RAT boots? (Y) (N)

	Boot Type		No	Yes	Total
Other Damage	A	N	99	9	108
		%	92%	8%	
	B	N	87	14	101
		%	86%	14%	
	C	N	74	13	87
		%	85%	15%	
	All	N	260	36	296
		%	88%	12%	

If YES, please explain the type of damage and how it happened.

	Other Durability Comments
A	A little peeling on the toes.
	Toe and heel peel
	Air holes came off.
	Heel began to fall apart.
	Heel counter cracked.
	Plastic piece in heel of boot broke near Achilles tendon
	Sole slightly coming apart
	The middle layer of the sole tears easily.
	The midsole was cut on a counter in the chow hall.

	Other Durability Comments
B	Eyelets broke off. Hole in vent.
	Vent hole popped out (x2)
	Plastic cracking in back
	Heel cracking
	It tore inside the boot slightly, the plastic came out but I was able to fix it.
	The fabric on heel ripped on the inside
	Right and left heels wore down prematurely.
	some wear and tear of the bottom of the soles
	Balls of the foot on the boots wore out fast
	The leather began to wear away.
	Tread was off quicker than expected
	When taking the right boot off the insole would come out too.

	Other Durability Comments
C	On the right collar on the left side where I stuff my laces, it became very loose and caused it to stick out.
	Eyelet tore out of leather upper, didn't get snagged, just from normal lacing and unlacing.
	Right boot vent hole popped out
	The ventilation circles on one of the boots came off, but don't know when it happened.
	The vents came off during the crucible.
	Vents fell off of both boots. Toe leather all scuffed up.
	The foam under the heel started to chip away and the area with plastic by the heel started caving in.
	The heels were chipped away quickly and just seemed to be falling apart
	Back heels came apart slightly
	Midsole cracking.
	Plastic in heel cracked
	Toe area was shaving away easily, reasoning why is unknown.

SECTION IV: RAT BOOTS – PERFORMANCE

16. Please rate how **comfortable/uncomfortable** you were wearing/evaluating the RAT boots while doing the activities listed below using the 7-point rating scale.

Very Uncomfortable	Moderately Uncomfortable	Slightly Uncomfortable	Neutral	Slightly Comfortable	Moderately Comfortable	Very Comfortable
①	②	③	④	⑤	⑥	⑦

	Boot	N	Mean	Std Dev
--	-------------	----------	-------------	----------------

	Type			
Running	A	113	4.4	1.81
	B	104	4.1	1.77
	C	93	4.2	1.77
	All	310	4.2	1.78
Walking	A	113	5.1	1.65
	B	103	4.9	1.69
	C	93	5.0	1.62
	All	309	5.0	1.65
Hiking	A	113	3.8	2.00
	B	104	3.6	1.97
	C	93	3.4	1.96
	All	310	3.6	1.98

No significant differences in the means between Boot Types for comfort while performing activities.

X	Y	Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	Prob > F
Boot Type	Running	Type	2	3.903	1.952	0.612	0.543
		Error	307	978.951	3.189		
		C. Total	309	982.855			
Boot Type	Walking	Type	2	2.739	1.370	0.500	0.607
		Error	306	838.102	2.739		
		C. Total	308	840.841			
Boot Type	Hiking	Type	2	8.053	4.027	1.030	0.358
		Error	307	1200.734	3.911		
		C. Total	309	1208.787			

17. When wearing/evaluating the RAT boots, did they make any noises or squeak? (Y) (N)

	Boot Type		No	Yes	Total
Noises	A	N	98	12	110
		%	89%	11%	
	B	N	94	7	101
		%	93%	7%	
	C	N	85	5	90
		%	94%	6%	
	All	N	277	24	301
		%	92%	8%	

18. Did you experience any blisters from wearing/evaluating the RAT boots? If YES, please provide location:

Ankle	<input type="radio"/>	Ball of foot	<input type="radio"/>	Back of heel	<input type="radio"/>
Toes	<input type="radio"/>	Sides of foot	<input type="radio"/>	Bottom of heel	<input type="radio"/>
Other (specify) _____					

	Boot Type		No	Yes	Total
Ankle	A	N	104	9	113
		%	92%	8%	
	B	N	95	9	104
		%	91%	9%	
	C	N	79	14	93
		%	85%	15%	
	All	N	278	32	310
		%	90%	10%	

	Boot Type		No	Yes	Total
Toes	A	N	33	80	113
		%	29%	71%	
	B	N	34	70	104
		%	33%	67%	
	C	N	26	67	93
		%	28%	72%	
	All	N	93	217	310
		%	30%	70%	

	Boot Type		No	Yes	Total
Ball of Foot	A	N	83	30	113
		%	73%	27%	
	B	N	68	36	104
		%	65%	35%	
	C	N	73	20	93
		%	78%	22%	
	All	N	224	86	310
		%	72%	28%	

	Boot Type		No	Yes	Total
Sides of Foot	A	N	100	13	113
		%	88%	12%	
	B	N	88	16	104
		%	85%	15%	
	C	N	88	5	93
		%	95%	5%	
	All	N	276	34	310
		%	89%	11%	

	Boot Type		No	Yes	Total
Back of Heel	A	N	74	39	113
		%	65%	35%*	
	B	N	66	38	104
		%	63%	37%*	
	C	N	43	50	93
		%	46%	54%	
	All	N	183	127	310
		%	59%	41%	

*Significant difference between blisters reported on back of heel for Boot A & B wearers as compared to Boot C wearers

Chi Square Test for Back of Heel Blisters		
Test	Chi Square	Prob > ChiSq
Likelihood Ratio	9.009	0.011
Pearson	9.086	0.011

	Boot Type		No	Yes	Total
Bottom of Heel	A	N	90	23	113
		%	80%	20%	
	B	N	74	30	104
		%	71%	29%	
	C	N	70	23	93
		%	75%	25%	
	All	N	234	76	310
		%	75%	25%	

Boot Type	Other Blister Locations
A	Back left of the heel on left foot
	Under toes
B	Tops of toes
	Under toe
	Between toes
	Between toes and main foot
	Bottom of foot
C	Bottom of foot near toes

Boot Type	Blister Comments
A	On hike
	Other than one on the toe, I have never gotten blisters no matter the boot; tough feet.
B	Overall only one small blister after crucible under the toe
C	May not have been caused by boot rather than hiking
	From crucible only
	Only during crucible

19. Did you experience any pressure points, hot spots, or rubbing in any of the below locations?
If YES, please provide location:

Ankle <input type="radio"/>	Instep <input type="radio"/>	Back of heel <input type="radio"/>
Toes <input type="radio"/>	Shins <input type="radio"/>	Sides of foot <input type="radio"/>

	Boot Type		No	Yes	Total
Ankle	A	N	105	8	113
		%	93%	7%	
	B	N	97	7	104
		%	93%	7%	
	C	N	88	5	93
		%	95%	5%	
	All	N	290	20	310
		%	94%	6%	

	Boot Type		No	Yes	Total
Toes	A	N	61	52	113
		%	54%	46%	
	B	N	47	57	104
		%	45%	55%	
	C	N	45	48	93
		%	48%	52%	
	All	N	153	157	310
		%	49%	51%	
	Boot Type		No	Yes	Total
Instep	A	N	96	17	113
		%	85%	15%	
	B	N	86	18	104
		%	83%	17%	
	C	N	69	24	93
		%	74%	26%	
	All	N	251	59	310
		%	81%	19%	
	Boot Type		No	Yes	Total
Shins	A	N	107	6	113
		%	95%	5%	
	B	N	97	7	104
		%	93%	7%	
	C	N	86	7	93
		%	92%	8%	
	All	N	290	20	310
		%	94%	6%	

	Boot Type		No	Yes	Total
Back of Heel	A	N	77	36	113
		%	68%	32%	
	B	N	67	37	104
		%	64%	36%	
	C	N	63	30	93
		%	68%	32%	
	All	N	207	103	310
		%	67%	33%	
	Boot Type		No	Yes	Total
Sides of Foot	A	N	94	19	113
		%	83%	17%	
	B	N	88	16	104
		%	85%	15%	
	C	N	80	13	93
		%	86%	14%	
	All	N	262	48	310
		%	85%	15%	

Boot Type	Hot Spot Comments
A	Ball of foot (x4)
	When I was hiking
B	Ball of foot
	Bottom of heel
	Underneath toes, edge of arch of the foot
C	Bottom of heel

SECTION V: RAT BOOTS – CHARACTERISTICS

20. Please rate how satisfied you were with the **characteristics** of the RAT boots using the 7-point rating scale below.

Very Dissatisfied	Moderately Dissatisfied	Slightly Dissatisfied	Neutral	Slightly Satisfied	Moderately Satisfied	Very Satisfied
①	②	③	④	⑤	⑥	⑦

	Boot Type	N	Mean	Std Dev
Appearance	A	113	4.6	1.83
	B	103	4.3	2.15
	C	93	4.5	2.00
	All	309	4.5	1.99
Arch Support	A	113	4.6	1.68
	B	102	4.4	1.63
	C	92	4.4	1.54
	All	307	4.5	1.62
Breathability	A	113	4.9	1.64
	B	104	4.6	1.54
	C	93	4.7	1.41
	All	310	4.7	1.54
Comfort	A	113	4.6	1.90
	B	104	4.3	1.83
	C	93	4.1	1.70
	All	310	4.3	1.82
Dry Out Time	A	108	5.1	1.43
	B	99	4.9	1.30
	C	90	5.0	1.29
	All	297	5.0	1.34
Durability	A	111	5.0	1.57
	B	103	5.2	1.46
	C	92	4.8	1.46
	All	306	5.0	1.50
Effectiveness in rainy/damp conditions	A	105	5.1	1.30
	B	96	4.8	1.36
	C	88	4.9	1.22
	All	289	5.0	1.30
Mission Suitability	A	113	4.9	1.68
	B	104	4.9	1.47
	C	93	4.8	1.47
	All	310	4.9	1.55
Traction on Wet Surfaces	A	105	5.1	1.40
	B	98	4.8	1.52
	C	88	4.9	1.47
	All	291	5.0	1.46

	Boot Type	N	Mean	Std Dev
Ventilation	A	112	4.8	1.55
	B	104	4.4	1.56
	C	91	4.7	1.43
	All	307	4.6	1.52
Weight	A	112	5.2	1.38
	B	104	4.8	1.70
	C	92	5.0	1.46
	All	308	5.0	1.52
Overall	A	112	4.8	1.69
	B	104	4.7	1.66
	C	90	4.6	1.54
	All	306	4.7	1.64

No significant differences between the means for the Boot Types for all performance characteristics.

SECTION VI: EXPOSURE TO WATER, LIKING, COMMENTS

21. Were the RAT boots exposed to water during the test period?

(Y)

(N)

If YES, what activity were you doing when the water was allowed to enter the boots?

	Boot Type		No	Yes	Total
Exposed to Water	A	N	41	72	113
		%	36%	64%	
	B	N	30	73	103
		%	29%	71%	
	C	N	43	47	90
		%	48%	52%	
	All	N	114	192	306
		%	37%	63%	

If YES, did the immersion in water degrade the RAT boot's performance?

(Y)

(N)

	Boot Type		No	Yes	Total
Water Degraded Performance	A	N	61	6	67
		%	91%	9%	
	B	N	68	5	73
		%	93%	7%	
	C	N	44	3	47
		%	94%	6%	
	All	N	173	14	187
		%	93%	7%	

22. Did the immersion in water degrade the boot's appearance?

(Y)

(N)

	Boot Type		No	Yes	Total
Water Degraded Appearance	A	N	60	9	69
		%	87%	13%	
	B	N	52	21	73
		%	71%	29%	
	C	N	42	5	47
		%	89%	11%	
	All	N	154	35	189
		%	81%	19%	

23. Were the RAT boots still comfortable after drying out?

(Y)

(N)

	Boot Type		No	Yes	Total
Comfortable after Drying Out	A	N	6	64	70
		%	9%	91%	
	B	N	9	62	71
		%	13%	87%	
	C	N	3	44	47
		%	6%	94%	
	All	N	18	170	188
		%	10%	90%	

24. Please rate how much you **like/dislike** the RAT boots you evaluated.

Dislike Very Much	Dislike Moderately	Slightly Dislike	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much
①	②	③	④	⑤	⑥	⑦

	Boot Type	N	Mean	Std Dev
Overall Liking	A	112	4.8	1.85
	B	104	4.6	1.95
	C	90	4.5	1.88
	All	306	4.6	1.89

No significant differences between the means for liking for the Boot Types.

X	Y	Source	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio	Prob > F
Boot Type	Liking	Type	2	4.340	2.170	0.604	0.547
		Error	303	1088.396	3.592		
		C. Total	305	1092.735			

Boot Type		Dislike (x≤3)	Neither (x=4)	Like (x≥5)
A	N	29	14	69
	%	25.9%	12.5%	61.6%
B	N	35	9	60
	%	33.7%	8.7%	57.7%
C	N	31	7	52
	%	34.4%	7.8%	57.8%

Appendix A. Focus Group Notes

Focus Group Composition

- A (Group 1): 15 recruits
- A (Group 2): 3 recruits
- A (Group 3): 4 recruits
- B (Group 1): 14 recruits
- B (Group 2): 19 recruits
- C (Group 1): 11 recruits
- C (Group 2): 4 recruits

How easy was it to take the RAT Boot on/off and break them in?

Boot Type	Responses
A (Group 1)	Heel got in the way; would have to tug extra hard to get the boot on.
	Inside of the heel broke down fast. It got harder to put on the boot as we got further in the cycle.
	It got easier and easier once the boot was broken in.
	Heel would get stuck; inside lining would bunch up.
	Needed to unlace far down.
A (Group 2)	Took a week or two to break in
	Difficult to doff when sweaty
	Generally, good to go
A (Group 3)	2 out of 4 had trouble doffing
	Took 1-2 weeks to break in
B (Group 1)	Easy to don/doff.
	Difficult to get heel in.
	Hard to don/doff when wet.
	Had to loosen up all the laces every time.
	It was hard with outer eyelets laced; took laces out of these eyelets.
B (Group 2)	1 recruit said it was more difficult to don than doff, 11 said it was more difficult to doff than don
	Break in time ranged from 0.5 weeks to the entire length of training, but most fell within the 0.5 – 2 weeks range
	10 recruits said they had issues donning and doffing
C (Group 1)	Difficult to don/doff; majority of Marines had to loosen up and yank.
C (Group 2)	Donning/doffing gets easier when broken in, but generally difficult
	For 2 recruits, took 1.5 weeks to break in. For 1 recruit, took a few months.

How did the boots fit?

Boot Type	Responses
A (Group 1)	The boot loosened up so much that my foot slid as it got further in the cycle.
	Toe stretched out.
	Ran big; needed a narrow.
	Loose around toes.
	Tight on toes but loosened up (x2).
	Too tight.
	Lost ankle support but still too tight around toes.
	Bottom of boot felt like stepping on 3 rocks.
	Tight on toes but arch area expanded.
A (Group 2)	2 recruits – good to go
	Arch was too flat
A (Group 3)	Numb toes, ball of foot, and when standing still whole foot
	Lace area too big
B (Group 1)	Tight around toes (x2).
	Tight around heel (had outer eyelets laced).
	Tight around toes and heel.
B (Group 2)	Numb toes (big toe and pad of the foot) – 13 recruits
	Numb heels – 9 recruits
	Laces restricted movement – 2 recruits
	Rolled ankles – 1 recruit
C (Group 1)	Foot slid back and forth – loose.
	Big in toe area.
	Pressure on heel in general.
	Too small around toes.
	Pressure on toes.
	Loose on side of foot (x2). With all the laces tightened material would bunch up.
C (Group 2)	Arch support poor for low arches
	Toe box too stiff

How was the comfort-in general? Any specific spots uncomfortable?

Boot Type	Responses
A (Group 1)	Rubbing at the back of the heel while running.
	Very comfortable.
	While moving around the boots were comfortable; prolonged standing was uncomfortable.
	I was walking on the front of my toes due to the fit of the boot.
A (Group 2)	In general, good to go
A (Group 3)	Walking around they hurt
	Liked boot but wear was excessive
B (Group 1)	Balls of feet and toes hurt after the hike.
	After standing a long time, bottom of my feet hurt (x2).
B (Group 2)	Standing still felt like an oven, causes numbness – 19 recruits
	Hot spot: heel – 14 recruits
	Hot spot: balls of feet – 8 recruits
	Friction on top of foot – 1 recruit
	Pinched nerve in arch – 1 recruit
	Poor arch support – 3 recruits
C (Group 1)	Not comfortable at all (x1).
	Very comfortable (x8).
C (Group 2)	Comfort – zero
	Heel bottom needs more padding
	Hiking blisters under and between toes
	Heavy for running (“clobbering”)
	Good ankle support

Did you have any durability issues with the RAT Boots?

Boot Type	Responses
A (Group 1)	Lining pulled out (x1)
	Sole separation (x1); happened 3 weeks ago at MCRD.
	11 broken heel counters; only 2 caused discomfort. The rest of the Marines did not notice until asked to check for it during data collection.
	Lining pulled out (x1)
A (Group 2)	Only during the crucible
	1 recruit had a cracked heel counter
A (Group 3)	All 4 had cracked heel counters
B (Group 1)	10 broken heel counters but none felt it.
	Impregnated leather on toe comes off/abraded (x14 - all Marines).
	Bottom of sole wore out fast.
	Excessive wear.
	-Broken stitching (x2).
	Insole came out when I pulled out my foot.
B (Group 2)	Sole separation – 4 recruits on the first phase of the crucible
	Lining was good
	Broken stitching on 1 recruit – no impregnated leather toe
	Cracked heel counters – 11 recruits; 10 of the 11 failed on the crucible
C (Group 1)	8 broken heel counters; majority did not notice until asked to check it during data collection.
	Sole separation.
	Collar got flimsy (x2).
C (Group 2)	Eyelet broke during the crucible
	One recruit said the only thing he liked about the boot was that it was durable
	On one recruit, sole separation on both heels and toes
	3 out of 4 recruits had broken heel counter

Did you experience any blisters/hot spots when wearing the RAT Boots?

Boot Type	Responses
A (Group 1)	Only this boot caused blisters (compared to other USMC boots) (x8). Blisters on toes from sliding.
A (Group 3)	None had blisters before the crucible, but all had blisters after
B (Group 1)	Over 2/3 got hotspots. 2 out of 14 got blisters in the first phase, all other in the 2 nd or 3 rd phase.
B (Group 2)	Blisters with normal use (8 recruits); blisters during the crucible (the original 8 plus 5 more recruits) Blisters on the toes, ball of foot, heel, and arches Hot spots (14 recruits) <ul style="list-style-type: none"> ○ Heels (11 recruits) ○ Toes (9 recruits) ○ Everywhere (1 recruit)
C (Group 1)	Majority got hot spots/blisters; ¼ happened at the crucible. Wore 2 pairs of socks to avoid blisters (x1).

Any appearance issues?

Boot Type	Responses
A (Group 1)	Color of the leather changed fast; leather bleached. Leather wore off of toe.
A (Group 2)	Impregnated leather toes did not hold up for any
A (Group 3)	Fading and sweat stains Impregnated leather failed
B (Group 1)	Do not like leather on toe (x7).
B (Group 2)	All of the toes are scuffed and peeled; some are peeling on the heel as well No impregnated leather toe preferred by all – also reported as more comfortable Faded color (11 recruits)
C (Group 1)	Do not like impregnated leather on toe (x4).
C (Group 2)	Perceived as ugly by all four

How was the breathability of the boot?

A (Group 1)	During hikes boots got really sweaty. Not breathable compared to other boots. Really breathable. Standing long periods of time, feet got hot.
A (Group 3)	One reported the boot did not breathe at all
B (Group 1)	Feet stayed a lot cooler (x3). Boot felt hot and did not breathe; combat boots were cooler.
B (Group 2)	Bad for breathability (5 recruits), especially when standing still
C (Group 1)	Sweat excessively but dried quickly (collar and ankle) (x4).
C (Group 2)	Poor More ventilation needed

Issues with dry out time?

Boot Type	Responses
A (Group 1)	Dried out a lot faster (x2).
	No problems with dry out time (x2).
A (Group 3)	Only one recruit got the boot thoroughly wet, and it took a few days to dry
B (Group 1)	Dry out time was fast (all Marines sweated in the boot).
	Boots were submerged in water; 1 stayed wet.
B (Group 2)	Dry out time okay
	Dry out time for perspiration GTG
C (Group 1)	When submerged, did not get wet.
	If it did get wet, it dried quickly.

Did the boot get wet? Any issues after the boot got wet?

Boot Type	Responses
A (Group 1)	Stayed wet.
A (Group 2)	Never got wet on the inside
B (Group 1)	Water spots.
	Changed color.
	Heel got heavy.
B (Group 2)	No issues when wet
C (Group 1)	No issues.
C (Group 2)	Poor traction

Any issues with traction?

Boot Type	Responses
A (Group 1)	Hard to do sharp pivots, foot got stuck.
	Slippery on tiles in the head.
A (Group 2)	Good to go
A (Group 3)	Lost traction when carrying pack
B (Group 1)	Traction lost on wet cement (indoors).
	Slipped on parade deck.
	Issues with pivoting.
C (Group 1)	Traction issues towards the end of the cycle.
	Difficult to pivot foot.
	Same amount of traction at the end of the cycle (x2).
C (Group 2)	Slippery on asphalt

Any other problems with the boot?

Boot Type	Responses
A (Group 3)	After breaking in, they felt too loose or soft, and lost support – caused rolled ankles

Overall, how well did the RAT Boots perform in the field? (& Improvements)

Boot Type	Responses
A (Group 1)	Want better insoles.
	Some had missing eyelets.
	Want better padding; has less than combat boot.
	Laces got looser.
A (Group 2)	“Give it a 10”
A (Group 3)	All recruits felt that the RAT boot got them through their training, but they did not like it
	Desired changes:
	- Soles more cushion
	- Better traction
B (Group 1)	Performed awesome in the crucible (x5).
	Wore 2 pairs of socks and still got blisters (x3)
	6 got blisters with 1 pair of socks in the crucible.
	2 pairs of socks alleviated pain/blisters.
B (Group 2)	Reported performance in the field as poor (15 recruits)
	Desired changes:
	- Better arch support
	- Better heel support
	- Too tight
	- Better ventilation
	- Better shock absorption – especially for ball of foot when running
	- Lighter than combat boots
C (Group 1)	They were comfortable.
	A lot more durable than other boots.
	Wanted to wear combat boots in the field (x5).
	1/2 felt these are a better/more durable field boot.
C (Group 2)	2 out of 4 recruits said performance was okay
	Ideal boot would have:
	- Smaller lip
	- No 3-layer sole construction
	- More cushion
	- More form-fitting
	- More aggressive tread

How many liked this boot overall? (show of hands)

Boot Type	Responses
A (Group 1)	13 out of 15
A (Group 2)	3 out of 3
A (Group 3)	1 out of 4
B (Group 1)	10 out of 14
B (Group 2)	3/19 recruits liked this boot overall - 2 of the 3 liked it better than the MCCB (1 of these recruits had one of the boots with no impregnated leather toes)
C (Group 1)	9 out of 11
C (Group 2)	4 out of 4

How many would recommend approving the manufacturer of this boot? (show of hands)

Boot Type	Responses
A (Group 1)	12 out of 15
A (Group 2)	3 out of 3
A (Group 3)	0 out of 4
B (Group 1)	7 out of 14
B (Group 2)	0 out of 19
C (Group 1)	11 out of 11 – ALL
C (Group 2)	Only one recruit commented, said he would not recommend